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Table.

Year	Month	Redemption Value	Profit		Rate
			Actual	Per Cent.	Per Year
1918	Jan.	4.12	0.88	21.3	4.3
1919	Jan.	4.24	0.76	17.9	4.5
1920	Jan.	4.36	0.64	14.6	4.9
1921	Jan.	4.48	0.52	11.6	5.8
1921	April	4.51	0.49	10.9	6.2
1921	July	4.54	0.46	10.1	6.7
1921	Oct.	4.57	0.43	9.4	7.5
1922	Jan.	4.60	0.40	8.7	8.7
1922	April	4.63	0.37	8.0	10.7
1922	July	4.66	0.34	7.2	14.4
1922	Oct.	4.69	0.31	6.6	26.4
1922	Nov.	4.70	0.30	6.4	38.4
1922	Dec.	4.71	0.29	6.2	74.4
1923	Jan.	5.00	Maturity		

While the table speaks for itself, four conclusions may be mentioned:

1. Stamps bought at the redemption value bear a rate of interest, calculated as simple interest, varying from 4.3 to 74.4 per cent. per year.
2. It becomes increasingly desirable to hold the stamps till maturity.
3. When sale is necessary, the post-office becomes an increasingly cheaper buyer than a private individual.
4. A loan with the stamps as collateral becomes increasingly desirable as opposed to sale.

For the sake of simplicity, all calculations are referred to the first day of the month and all interest is assumed to be simple. The writer has never had this aspect of the War Savings Stamps called to his attention, and believes it might be of interest, if not of value, to readers of the MONTHLY.

RECENT PUBLICATIONS.

BOOK REVIEWS.

Les Principes de L'Analyse Mathématique. Exposé Historique et Critique. By PIERRE BOUTROUX. 2 volumes, Paris, A. Hermann & Fils, 1914–1919. Royal 8vo. xi + 547 + 512 pages. Price 14 + 20 francs.

In these two volumes we have one of the most suggestive historical and critical surveys of the whole field of elementary mathematics that has appeared in recent times. The purpose of the work may be best stated in the words of the author: "Except for these restrictions [demonstrations of certain theorems and detailed explanations of technique] the present work contains all or nearly all the material contained in the course in 'general mathematics' given in our

Faculties of Science. It moreover goes beyond them notably in that it touches in some places on certain of the highest chapters of modern analysis, and on the other hand it takes up mathematical science at its origin, in its principles, in order to present as nearly as can be done a view of the whole. . . . Its first object is none the less to furnish objective information and to serve as a guide to beginners in mathematics."

If the word "beginners" is properly interpreted—let us say, beginners in the work of our graduate schools—this object has been very successfully attained. The greatest value of the work, however, is for the teacher or advanced student who wishes to gain a comprehensive view of the whole field of mathematics, either as a body of knowledge, or more especially as a mode of thought. And many parts of it will be found valuable for supplementary reading on the part of undergraduates who are interested in getting at the bottom of things.

The care with which the fundamentals are discussed may be inferred from the fact that the first chapter, on (rational) "numbers," covers 61 pages, and the second, on "magnitudes" (including irrational numbers defined both arithmetically and geometrically) covers 118 pages. After passing more rapidly over some of the important topics and methods of elementary geometry, plane trigonometry, and algebra, we reach the study of functions, to which the remainder (239 pages) of the first volume is devoted, the point of view being almost purely arithmetical. The second volume enters upon the discussion of analytic geometry in two and in three dimensions, to which about 125 pages are given; and then follows a chapter (97 pages) on "extension of algebra, and logical constructions," which includes the elementary parts of the algebra of complex numbers, the elementary parts of group theory, with an indication of their applications to the theory of algebraic and differential equations; and a discussion of the foundations of algebra and geometry. Then follow developments in series (36 pages) and infinitesimal calculus (85 pages). The last two chapters, entitled "Analysis of Mathematical Principles" and "Analysis of the Notion of Function" cover 37 and 71 pages respectively. The last chapter includes the elementary properties of functions of a complex variable, such as Cauchy's integral theorems, Taylor's series, singular points, analytic extension, and simply and doubly periodic functions, with mention of elliptic functions and integrals.

As an example of the methods of treatment which are employed, we may take the subject of the conic sections. They are first taken up as sections of a cone, in vol. I, pages 241ff., where the work of the Greeks is cited, without however being described in detail; then the curves are discussed more at length as plane loci, but without any use of coördinates; and only in vol. II, pages 50–65, do we meet with the study of these curves from their equations. At this point it seems regrettable that the author has let slip the opportunity to point out the connection between the locus problem and the equation; there is no intimation that the equation could have been obtained from the definition of the curve as a locus, but only the converse procedure is mentioned, and that, too, starting from the general equation. Another detail of arrangement seems to the reviewer defective: that determinants are taken up immediately *after* the study of transformations of coördinates has been completed; had this order been changed, the classification of equations of the second degree could have been stated in a neater and more concise manner, and much of the work in analytic geometry of 3 dimensions could likewise have profited. Indeed no mention is made in connection with determinants that they are used at all in geometry.

The author's view of the nature of mathematical analysis is brought out clearly in the admirable introductory chapter to the third book (volume II, pages 259–267). Analysis, as understood today, may be regarded as a combination and reconciliation of the two tendencies which have been more or less in opposition one to the other throughout the whole history of mathematics: the tendency to look outward upon the world and seek to understand and explain it, and the tendency to look inward to the forms of thought itself, and to develop methods of reasoning for their own sake. Modern analysis is in fact concerned with both these points of view, and Professor Boutroux has summarized the historical developments in such a way as to make the fact stand out strikingly. The same subject is continued and amplified in the penultimate chapter, where the fundamental relations of number and magnitude are subjected to a careful scrutiny, in the light of the results of the infinitesimal calculus. It is brought out clearly that in the modern idea of the irrational number we have the bridge that connects the discrete world of (cardinal) *numbers* with the continuous world of (geometric) *magnitude.* Thus we gain a firm basis for the concept of continuity, and the general notions of the function theory, with which the book concludes.

A few slips occur: thus, vol. I, p. 20, line 4 from the end, *n times unity* should be $(n + 1)$ *times unity,* and similar changes should be made three times at the top of p. 21. On p. 38, at the end of § 31, the statement that "the first rigorous and complete exposition of calculation with fractions is found in Stevin's *Arithmétique*" is too sweeping, as (to mention only one name) Leonardo of Pisa[1] gives an account that leaves nothing to be desired—unless probably brevity. On p. 139, the two expressions are equal $(= 4/\pi)$ instead of one being $= 2/\pi$ as stated. On p. 183, Thales is said to have had scarcely any but a practical knowledge of geometry; this seems overdrawn in view of Proclus's ascription to him of "general treatment" (καθολικώτερον) of certain problems, along with the general, if less well-authenticated, crediting of the theorem of the right angle inscribed in the semicircle to him. On page 521, Fermat is credited with having stated "very clearly the conception of the derivative and the characteristic [differential] triangle." As to the derivative, this is surely overdrawn, and it seems doubtful if it can be maintained as to the differential triangle. In vol. II, page 58, the word "supplementary" in the next to the last line should be replaced by "one exceeding the other by π."

There is an unfortunately large number of misprints, even after those noted in the "Errata" have been corrected; perhaps those most likely to be confusing are vol. I, page 90, next to last line, read *parallèles* for *perpendiculaires*; page 146, line 4 from end, interchange *grande* and *petite*; page 169, lines 5 and 6, interchange *sinus* and *cosinus*; page 183, line 4 of the note, for *qualité* read *quantité;* page 266, line 11, for *aa, bb, cc,* read *a, b, c;* page 406, last and 4th from last lines, interchange *maximum* and *minimum;* and similarly on page 522, where in the last line the inequality signs should be reversed; vol. II, page 56, the figure should be numbered 245.

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[1] *Scritti di Leonardo Pisano,* Rome, 1857, vol. I, pp. 47–83.

None of these minor blemishes, however, can affect the final judgment of the work, which is that through its clear presentation and discriminating evaluation of so many of the most important topics in the whole field of mathematics, as well as through its stimulation to further thought and investigation along all lines, this book is a really great contribution to mathematical literature, which should be in the possession of every teacher.

R. B. McCLENON.

Tables of the Exponential Function and of the Circular Sine and Cosine to Radian Argument. By C. E. VAN ORSTRAND. (*Memoirs of the National Academy of Sciences,* volume 14, fifth memoir.) Washington, D. C., 1921. 4to. 79 pp.

Mr. Van Orstrand, a physical geologist of the U. S. Geological Survey, and a charter member of the Association, has once more rendered fine service to workers in certain fields of applied mathematics. In 1909 he collaborated with G. F. Becker in publishing the 360 page volume, *Hyperbolic Functions* (Smithsonian Mathematical Tables). He has now published fourteen tables concerning which some preliminary publications appeared in *Journal of the Washington Academy of Sciences,* 1912–13. The tables are as follows:

I: Values of the reciprocal of $n!$ to 108 places of decimals at intervals of unity from 1 to 74; II: Values of e^x to 42 significant figures at intervals of unity from 0 to 100; III: Values of e^x to 33 significant figures at intervals of 0.1 from 0.0 to 50.0; IV: Values of e^x to 62 places of decimals at decimal intervals from 1×10^{-14} to 9×10^{-1}; V: Values of e^{-x} ranging from 52 to 62 places of decimals at intervals of unity from 0 to 100; VI: Values of e^{-x} ranging from 33 to 48 places of decimals at intervals of 0.1 from 0.0 to 50.0; VII: Values of e^{-x} to 62 places of decimals at decimal intervals from 1×10^{-10} to 9×10^{-1}; VIII: Values of $e^{\pm (n\pi/360)}$ to 23 places of decimals or significant figures at intervals of unity from $n = 0$ to $n = 360$; IX: Values of $e^{\pm n\pi}$ to 25 places of decimals or significant figures for various values of n; X: Values of $\sin x$ and $\cos x$ to 23 places of decimals at intervals of unity from 0 to 100; XI: Values of $\sin x$ and $\cos x$ to 23 places of decimals at intervals of 0.1 from 0.0 to 10.0; XII: Values of $\sin x$ and $\cos x$ to 23 places of decimals at intervals of 0.001 from 0.000 to 1.600; XIII: Values of $\sin x$ and $\cos x$ to 25 places of decimals at decimal intervals from 1×10^{-10} to 9×10^{-4}; XIV: Miscellaneous values of e^x, e^{-x}, $\sin x$ and $\cos x$ to a great number of decimals, including Boorman's value of e.

In preparing such tables the author sought not only to obtain "a few high place values at sufficiently small intervals of argument for general use in the evaluation of integrals and other functions," but also to obtain "a basis for